

# MAGNESIUM METAL<sup>1</sup>

(Data in thousand metric tons unless otherwise noted)

**Domestic Production and Use:** In 2022, primary magnesium was produced by one company in Utah at an electrolytic process smelter that recovered magnesium from brines from the Great Salt Lake. Secondary magnesium was recovered from scrap at smelters that produced magnesium ingot and castings and from aluminum alloy scrap at secondary aluminum smelters. Primary magnesium production in 2022 was estimated to have decreased significantly from that in 2021. Information regarding U.S. primary magnesium production was withheld to avoid disclosing company proprietary data. The leading use for primary magnesium metal, which accounted for 58% of reported consumption, was in castings, principally used for the automotive industry. Aluminum-base alloys that were used for packaging, transportation, and other applications accounted for 20% of primary magnesium metal consumption; desulfurization of iron and steel, 14%; and all other uses, 8%. About 35% of the secondary magnesium was consumed for structural uses, and about 65% was used in aluminum alloys.

<b>Salient Statistics—United States:</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022<sup>e</sup></b>
Production:					
Primary	W	W	W	W	W
Secondary (new and old scrap)	109	103	95	103	120
Imports for consumption	47	59	61	50	97
Exports	12	10	15	8	5
Consumption:					
Reported, primary	56	57	54	51	50
Apparent <sup>2</sup>	W	W	W	W	W
Price, annual average: <sup>3</sup>					
U.S. spot Western, dollars per pound	2.17	2.45	2.49	3.55	7.60
European free market, dollars per metric ton	2,550	2,425	2,149	5,008	5,500
Stocks, producer, yearend	W	W	W	W	W
Employment, number <sup>e</sup>	400	400	400	400	400
Net import reliance <sup>4</sup> as a percentage of apparent consumption	>25	>25	>25	>25	>50

**Recycling:** In 2022, about 37,000 tons of secondary magnesium was recovered from old scrap and 83,000 tons was recovered from new scrap. Aluminum-base alloys accounted for about 58% of the secondary magnesium recovered, and magnesium-based castings, ingot, and other materials accounted for about 42%.

**Import Sources (2018–21):** Magnesium metal (99.8% purity): Israel, 31%; Russia, 29%; Turkey, 27%; Canada, 6%; and other, 7%. Magnesium alloys (magnesium content): Taiwan, 28%; Czechia, 16%; Germany and Israel, 14% each; and other, 28%. Sheet, powder, and other (magnesium content): Austria, China,<sup>5</sup> and Mexico, 20% each; Canada, 17%; and other, 23%. Scrap: Canada, 38%; Mexico, 19%; China,<sup>5</sup> 14%; Taiwan, 6%; and other, 23%. Combined total (includes magnesium content of alloys, metal, powder, and other): Canada, 21%; Israel, 11%; Mexico, 10%; Taiwan, 9%; and other, 49%.

<b>Tariff:</b>	<b>Item</b>	<b>Number</b>	<b>Normal Trade Relations 12–31–22</b>
	Unwrought metal	8104.11.0000	8% ad valorem.
	Unwrought alloys	8104.19.0000	6.5% ad valorem.
	Waste and scrap	8104.20.0000	Free.
	Powders and granules	8104.30.0000	4.4% ad valorem.
	Wrought metal	8104.90.0000	14.8¢/kg on magnesium content + 3.5% ad valorem.

**Depletion Allowance:** Dolomite, 14% (domestic and foreign); magnesium chloride (from brine wells), 5% (domestic and foreign).

**Government Stockpile:** None.

**Events, Trends, and Issues:** Production issues continued throughout the year at the only U.S. primary magnesium smelter. On September 29, 2021, the producer of primary magnesium in Utah declared force majeure on supply contracts, citing equipment failures. Details on the amount of capacity affected and the expected restart date were not reported by the company. In 2022, some customers reported temporarily shutting down some facilities citing magnesium shortages including a facility in Indiana that produces aluminum can sheet which shut down some capacity in July until September when an alternative source of magnesium was obtained. The shutdown of capacity in Utah was cited as the reason why the average annual U.S. spot Western price nearly doubled from the annual average price in 2021. In August, the producer applied for a permit to extend the brine intake canals on the Great Salt

## MAGNESIUM METAL

Lake into deeper water, but in December the permit was denied by State regulators. The producer stated that the declining water level after several years of drought threatened to disrupt production.

Magnesium prices in Europe decreased significantly during the first half of the year compared with those of the last quarter of 2021 when they reached record highs. By the end of January 2022, the price range in Europe was \$8,400 to \$8,700 per metric ton and it continued to decline, reaching a range of \$3,700 to \$3,900 per metric ton at the end of July. For the remainder of the year, the price range in Europe declined, reaching a range of \$3,400 to \$3,550 per metric ton at the end of November, a price range not observed since May 2021. The 2022 annual average price range for magnesium in Europe was 10% higher than that for 2021.

One company planned to build a pilot plant in Ohio to test magnesium production from dolomite. A company in Quebec, Canada, planned to construct a primary magnesium smelter to produce magnesium from serpentine-bearing asbestos tailings. In Australia, a company started construction of a 1,000-ton-per-year demonstration plant to recover magnesium from coal fly ash, with production scheduled to start by the end of June 2023.

The use of magnesium in automobile parts continued to increase as automobile manufacturers sought to decrease vehicle weight for increased fuel efficiency. Magnesium castings have substituted for aluminum, iron, and steel in some automobiles. The substitution of aluminum for steel in automobile sheet continued to increase consumption of magnesium in aluminum alloy sheet. A shortage of computer chips was cited for some automobile manufacturers decreasing production despite strong demand, resulting in some diecasters decreasing magnesium consumption.

### World Primary Production and Reserves:

	<b>Smelter production</b>		<b>Reserves<sup>6</sup></b>
	<u>2021</u>	<u>2022<sup>e</sup></u>	
United States	W	W	Magnesium metal can be derived from seawater, natural brines, dolomite, serpentine, and other minerals. The reserves for this metal are sufficient to supply current and future requirements.
Brazil	20	20	
China	<sup>e</sup> 930	900	
Israel	18	20	
Kazakhstan	16	15	
Russia	<sup>e</sup> 58	50	
Turkey	13	13	
Ukraine	<u>10</u>	<u>2</u>	
World total (rounded) <sup>7</sup>	1,070	1,000	

**World Resources:**<sup>6</sup> Resources from which magnesium may be recovered range from large to virtually unlimited and are globally widespread. Resources of dolomite, serpentine, and magnesium-bearing evaporite minerals are enormous. Magnesium-bearing brines are estimated to constitute a resource in the billions of tons, and magnesium could be recovered from seawater along world coastlines.

**Substitutes:** Aluminum and zinc may substitute for magnesium in castings and wrought products. The relatively light weight of magnesium is an advantage over aluminum and zinc in castings and wrought products in most applications; however, its high cost is a disadvantage relative to these substitutes. For iron and steel desulfurization, calcium carbide may be used instead of magnesium. Magnesium is preferred to calcium carbide for desulfurization of iron and steel because calcium carbide produces acetylene in the presence of water.

<sup>e</sup>Estimated. W Withheld to avoid disclosing company proprietary data.

<sup>1</sup>See also the Magnesium Compounds chapter.

<sup>2</sup>Defined as primary production + secondary production from old scrap + imports – exports ± adjustments for industry stock changes.

<sup>3</sup>Source: S&P Global Platts Metals Week.

<sup>4</sup>Defined as imports – exports ± adjustments for industry stock changes.

<sup>5</sup>Includes Hong Kong.

<sup>6</sup>See Appendix C for resource and reserve definitions and information concerning data sources.

<sup>7</sup>Excludes U.S. production.